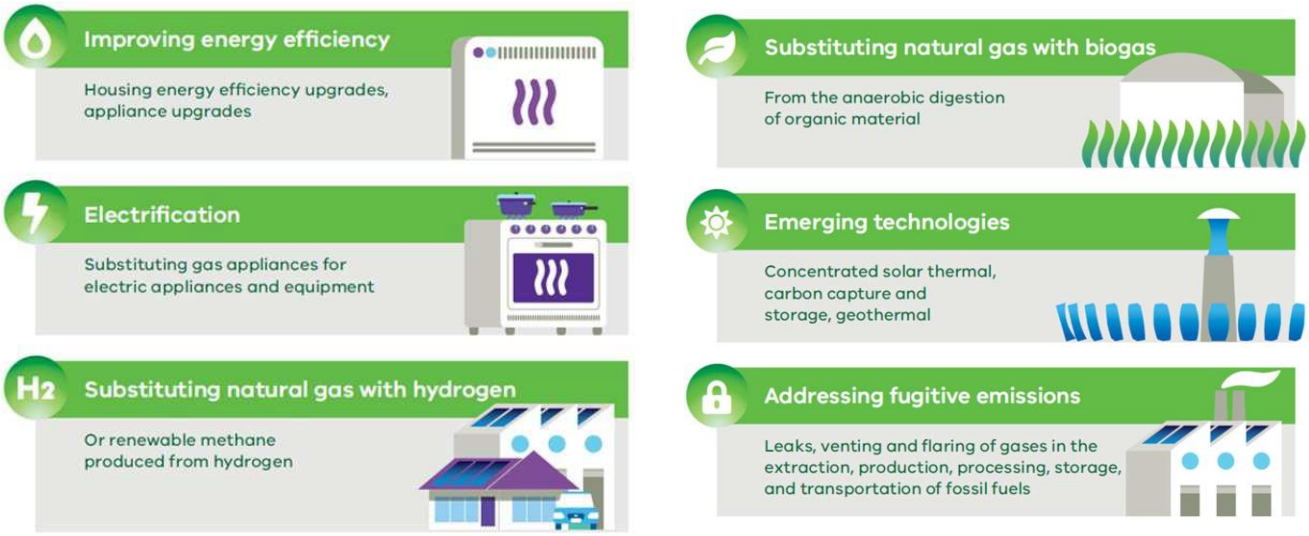
16 August 2021

Victorian Gas Substitution Roadmap Submission

Gas decarbonisation pathways



Introduction

According to AEMO report "Gas Statement of Opportunities 2020 and 2021", Victoria consumes more energy from gas than from electricity. Although depressed from 2019 levels, gas pricing is slowly increasing and with supply expected to reduce by more than 35% over the next five years, pricing will continue to put pressure on affordability, especially during Victoria's peak winter days. Additionally, there are currently no new projects in the pipeline, in line with the determined effort to move consumers away from gas to electricity.

Diversion strategies are hoped to merely flatten, rather than decrease consumption over the next decade. The AEMO report clearly states that demand management initiatives or expansions are needed to assist in mitigating supply scarcity risks.

Despite all these predictions, Victorian Government allocated $1.854b to renewable energy, yet only $10 million *"to support investment in WtE technologies that will help reduce reliance on natural gas and divert waste from landfill"* and well as $10 million to develop the Victorian Renewable Hydrogen Industry Development Plan - (Gas Substitution Roadmap). Advanced Thermal Treatments (ATT) have been demonstrated to provide a helpful substitute for gas supply in a wide range of domestic and industrial locations across Europe.

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Our contribution herewith is presented from the perspective of being the authorised developer partner for world leading ATT technology for waste to energy, known as the Concord Blue Reformer. Developed in Germany over the past 20 years, this technology, being dramatically different from any form of incineration, uses a patented process known as Steam Thermolysis, which creates high quality, hydrogen rich, syngas from almost any carbon-based feedstock, without incineration and the associated fugitive emissions.

Furthermore, this process has been demonstrated and proven to be capable of delivering clean, renewable hydrogen from biomass feedstock. Several dedicated plants designed in this model are currently under way in Germany and elsewhere.

Although not qualified to comment expertly on some of the pathways below, our observations are based on the above experiences and nevertheless lend further support to many of the conclusions already drawn by this paper and others, that require further attention, including targeted funding for alternative sources, beyond natural gas.

Electrification

As demonstrated in the Consultation Paper, switching the vast demand for domestic gas to electricity, particularly in winter, will have a direct and negative impact on electricity supply/demand balances. Peak usage in the critical cold months in Victoria will not dovetail with peak output via renewable sources such as solar. Those residents with little or no independent solar capability due to either rental, income limitations or simply being in an unsuitable location, would be forced to pay ever increasing costs for their electricity, with no alternative in a black-out or similar under-supply scenario. As discussed in the Paper, the current structure of the Eastern Seaboard power grid, is not geared towards efficient, decentralised distribution, given the likely new demands of domestic and mobility users. This requires a reworking of the grid and distribution network as a priority.

Even as we write this response, new residential developments today are still being built with mains gas supply built into all properties with gas powered hot water, heating and cooking being the standard. The ambition of transferring of gas usage to electricity is an extremely long-term target.

A smaller but still significant portion of gas is used in industry, mostly in certain types of industrial processes. This is particularly evident in high temperature manufacturing, where gas is imminently more efficient and cost effective than electricity. Under those specific circumstances, large manufacturers in these environments should be encouraged to look for a synthetic gas substitute rather than electrification, underwritten by government incentives. Such a transition would require varying degrees of modification of equipment, already tried and executed successfully in Europe.

Substituting natural gas with hydrogen

Hydrogen certainly has potential as a gas supplement in the immediate future, but full substitution in the long term is an expensive and not necessarily cost-effective option. Trials in a range of European locations have confirmed that the maximum hydrogen suitable for gas mains injection is no greater than 10%. Numerous manufacturers of a wide range of domestic and commercial equipment confirm that as hydrogen burns at a

higher rate than natural gas, equipment must be manufactured differently, mere adjustments are not always possible. Residential appliances are equally affected.

Further to this, the aging gas pipelines across Victoria are not capable of accepting hydrogen in greater concentrations than the 10% noted above. This also leads to a long term, slow and expensive option, should it be seriously considered, leaving a gap of 15-20 years before it could be seen as near completion – assuming the hydrogen quantities were available and affordable. Leading energy suppliers are open about their ambitions of gas replacement with hydrogen, stating that it won't be realised until at least 2040 and then not widely distributed.

Furthermore, the desired price of A$2/kg for green hydrogen is a long-term ambition. Currently the HESC project, piloting extraction of hydrogen from fossil fuels is still aiming at production costs of up to US$2.60/kg, for grey/blue hydrogen. Add to that the distribution and retail costs, together with government fees and taxes, makes the retail price much closer to US$5/kg. In addition, so far there has been no definitive conclusion drawn from local and international projects that the Carbon Capture and Storage project, CarbonNet, can actually successfully achieve its aim of safely storing up to 90% of the emissions from the site. Finally, this project, currently the largest in Australia, is still required to purchase carbon offsets to mitigate emissions from the site.

With regard to green hydrogen, there is increasing attention being paid overseas to the "whole of life" costs and emissions of producing this product. In addition to the electricity cost, 9 litres of water required for every kg of hydrogen produced, attention is now being paid to the costs of building desalination plants, electrifiers via wind farms or solar and the ultimate disposal of end-of-life componentry from these installations. ("Hydrogen generation in Europe: Overview of costs and key benefits" – European Commission)

In short, hydrogen can only be seen as a supplement rather than major substitution for natural gas, for fixed infrastructure usage. Where it can be of benefit is in the mobility sector, where hydrogen is a real and viable replacement for LPG powered vehicles. Hydrogen bowsers could be added to existing fuelling stations, refilling is quicker than battery charging and the range per fill is greater. Hydrogen would be competitive with existing fuels and would be a substantial benefit for heavy vehicles and industrial equipment which require huge, heavy batteries in an electric model. Further, it has been demonstrated across Europe that hydrogen conversion for long distance trains is more efficient and economical than electrification of those same line, potentially saving two thirds of the cost.

Substituting natural gas with biogas

The paper outlines some of the complexities in using biogas as a natural gas substitute. It also points out that a key by-product of using biogas is a greenhouse gas, carbon dioxide. Biogas is seen as renewable due to the organic sources of the process. However, a number of commercial endeavours in Australia and Victoria have experienced many of the shortcomings of relying on biogas for industrial purposes, including the conservative range of feedstocks suitable and the variability in efficiency. Additionally, because biogas generation is temperature sensitive, this is more noticeable in colder months, where gas energy use is higher.

Emerging technologies

It is now proven that syngas produced from biomass may be a versatile and useful alternative to natural gas for a range of industrial processes, reducing the demand for natural gas. Syngas produced from biomass such as wood waste and similar matters is now the focus of new developments in Germany. These projects are aimed at injection into gas pipelines and also behind the grid networks for hydrogen. One such project has the hydrogen produced certified assessed as "green hydrogen" under the EU LIFE Programme, which is the official EU funding instrument for the environment and climate action. Set up in Rendsburg, northern Germany, it will process biomass and wet residues in a sulphur-free, carbon-neutral environment, resulting in high-quality hydrogen. The resulting hydrogen will be fed into mains pipelines as well as useful for mobility and industrial purposes.

Addressing fugitive emissions

We do not propose to address this subject, as it is outside our direct experience.

Our Proposition

The EU has convincingly demonstrated that decarbonisation of the gas sector has its beginning in first and foremost coming to terms with the latest in advanced renewable gas producing technology.

One such leading-edge contender in the Victoria gas sector decarbonisation confront is to be found in the waste to energy sector. Pioneered in Germany, the CBR® Reformer allothermal technology produces quality syngas and hydrogen, virtually free of toxic emissions from MSW and other waste.

One of the most politically acceptable and economically viable means to decarbonise the Victorian gas sector is to inject verified renewable gas such as quality syngas into existing gas networks.

The early attempts in the EU were mostly supported by on-the-spot use, mainly for electricity generation. Only a small share was injected into the gas grid, which in recent times has reversed dramatically.

The results of injecting quality syngas into the gas grid have been quite positive, directly increasing the value of renewable gas. However, the considerable increase of renewable gas production would not have been possible without concrete Government support, together with the "Guarantees of Origin" (GoO) certification that facilitates the uptake of renewable gas in the grid, as well as in direct delivery to industry.

Whereas technology such as the CBR® Reformer is a reliable and proven mechanism that positively impacts emission reduction targets, it needs to be stressed that this technology achieves that outcome while reducing Victoria's mounting waste burden.

It is paramount, that any supply agreement for renewable gas is subject to a GoO for tracing the origin of the gas, by what method it was produced, and states impurities such as tar and likely greenhouse gas emissions like those associated with methane. This is of particular importance in gas trading to bridge supply and demand in regional Victoria and perhaps even with other States.

The BlueGas Technologies group, who introduced the German CBR® Reformer to Australia, are pleased to advise that this, the world's foremost waste to quality syngas and hydrogen conversion technology, has been contracted by the German government to build the world's largest and most advanced waste to syngas/hydrogen plant near Hamburg.

The BlueGas Technologies group can fulfill an important role in decarbonising the Victoria gas sector, by an allocation of 50% of government funding for the development of a demonstration plant, in close proximity to an industry hub that is gas reliant.

The success of this technology in the EU, South Korea and Taiwan should persuade Government and industry to replicate a CBR® Reformer network in Victoria, to ensure adequate supply of green syngas/hydrogen to industry and the community.

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